

## Storage for Bulk Goods with Overhead Withdrawal

### Claims

1. A storage device for interlocking bulk goods, comprising:
  - a) a storage container (3);
  - b) a feeding device for filling said storage container (3) with said bulk goods;
  - c) and spiked shafts (10) arranged in the storage container (3) which are rotary driven about their rotational axes (Dw) and mate with each other in order to convey the bulk goods to be withdrawn from the storage container (3) in a conveying direction perpendicular to their rotational axes (Dw);
  - d) wherein said spiked shafts (10) are arranged such that they engage with the bulk goods in order to withdraw them from above.
2. The storage device as set forth in claim 1, characterised in that a withdrawing means which is preferably formed by a fall-pipe (30) protrudes in terms of height through a column of bulk goods formed in the storage container (3) as far as a central region of a free upper surface of said column of bulk goods, and in that the conveying direction of the spiked shafts (10) points from a periphery of the column of bulk goods, along the free upper surface, to said withdrawing means.
3. The storage device as set forth in claim 1 or 2, characterised in that a withdrawing means arranged in the conveying direction of the spiked shafts (10) is a fall-pipe (30) into which the spiked shafts (10) convey the bulk goods.

4. The storage device as set forth in the preceding claim, characterised in that the fall-pipe (30) can be changed in length, in order to adjust its height to a height of the column of bulk goods accommodated in the storage container (3).
5. The storage device as set forth in the preceding claim, characterised in that the fall-pipe (30) comprises pipe segments (31-35) which can be axially slid into each other and which slave each other when the fall-pipe (30) is shortened, such that a telescopic pipe is formed, wherein said axially movable pipe segments (31-34) preferably also slave each other when the fall-pipe (30) is extended.
6. The storage device as set forth in any one of claims 2 to 5, characterised in that the spiked shafts (10) are arranged in the storage container (3) such that they can be lowered and the withdrawing means can be changed in length, in order to shorten it when the spiked shafts (10) are lowered.
7. The storage device as set forth in the preceding claim, characterised in that the spiked shafts (10) are mounted in a frame (15, 20) which can be lowered, such that they can be rotated about their rotational axes (Dw), and in that one end of the withdrawing means which forms an upper opening of the withdrawing means through which the spiked shafts (10) convey the bulk goods into the withdrawing means is connected to said frame (15, 20), such that when the frame (15, 20) is lowered, it slaves said end of the withdrawing means, in order to shorten the withdrawing means.
8. The storage device as set forth in any one of claims 2 to 7, characterised in that a withdrawing conveyor (7) is arranged beneath the withdrawing means, in order to withdraw the bulk goods.
9. The storage device as set forth in any one of the preceding claims, characterised in that the spiked shafts (10) are mounted in a frame (15, 20) such that they can rotate about their rotational axes (Dw) and said frame (15, 20) is arranged in the storage container (3) such that it can be lowered and raised.

10. The storage device as set forth in the preceding claim, characterised in that the frame (15, 20) comprises a lowering and rising frame (20) and a pivoting frame (15) which can be jointly lowered and raised, and in that said lowering and rising frame (20) mounts said pivoting frame (15) such that it can be pivoted about a pivoting axis (Ds) and the pivoting frame (15) mounts the spiked shafts (10) such that they can be rotated about their rotational axes (Dw).
11. The storage device as set forth in the preceding claim, characterised in that the lowering and rising frame (20) is supported on the storage container (3) such that it cannot rotate about the pivoting axis (Ds), in order to absorb a reaction moment necessary for the pivoting movement of the pivoting frame (15).
12. The storage device as set forth in the preceding claim, characterised in that the support, secured against rotation, of the lowering and rising frame (20) is formed by at least one guiding cam (6) extending in the direction of the lowering and rising movement of the lowering and rising frame (20) and at least one engaging element (22) guided along said guiding cam (6), wherein the guiding cam (6) is preferably connected to a side wall of the storage container (3) such that it cannot rotate about the pivoting axis (Ds), and said engaging element (22) is preferably connected to the lowering and rising frame (20) such that it cannot rotate about the pivoting axis (Ds).
13. The storage device as set forth in any one of the preceding four claims, characterised in that the storage device comprises a lowering and rising drive having at least one motor (8) which is coupled to the frame (15, 20), in order to lower the frame (15, 20) for withdrawing the bulk goods and to raise the frame (15, 20) for filling the storage container (3).
14. The storage device as set forth in the preceding claim, characterised in that said lowering and rising drive is a winch drive (8, 9).

15. The storage device as set forth in any one of the preceding two claims, characterised in that the lowering and rising drive comprises a regulator or a controller for said at least one motor (8) and at least one distance sensor (25) which detects a vertical distance between a frame (15, 20) which mounts the spiked shafts (10) and the bulk goods, and in that said distance is fed to said regulator as a regulating variable or to said controller as a controlling variable, to form a manipulated variable for the at least one motor (8).
16. The storage device as set forth in any one of the preceding claims, characterised in that a rate at which the spiked shafts (10) are lowered for withdrawing the bulk goods is set in accordance with a plunging depth of the spiked shafts (10) into the bulk goods, as determined by measurement.
17. A storage facility comprising at least two storage devices as set forth in any one of the preceding claims, connected to each other by a common feeding device and/or a common withdrawing conveyor (7), in order to be able to alternately fill and empty the storage container (3) of one storage device (1) and the container (3) of the at least one other storage device (2).
18. A storage device for interlocking bulk goods, comprising:
  - a) a storage container (3);
  - b) a feeding device for filling said storage container (3) with said bulk goods;
  - c) a withdrawing means (30) which protrudes in terms of height through a column of bulk goods formed in the storage container (3) as far as a central region of a free upper surface of said column of bulk goods;
  - d) and a rake conveyor arranged in the storage container (3), comprising a traction means and rakes drawn by said traction means which engage with the bulk goods on said free upper surface of the column of bulk goods, in order to convey the bulk goods, on its own or together with a conveyor of a different design, in a conveying direction from the periphery of the surface of the column of bulk goods to said withdrawing means.

19. A method for withdrawing interlocking bulk goods from a storage container (3), wherein a carrying-off means arranged in said storage container (3) and formed by spiked shafts (10) or/and at least one rake conveyor engages with the column of bulk goods on a free upper surface of a column of bulk goods formed in the storage container (3) from the bulk goods and conveys said bulk goods along said surface to a withdrawing means (30), preferably a vertical conveying means (30), which transfers the bulk goods downwards onto a withdrawing conveyor (7).
20. The method as set forth in the preceding claim, characterised in that the bulk goods fall through the withdrawing means (30).
21. The method as set forth in any one of the preceding claims, characterised in that the withdrawing means (30) protrudes in terms of height through the column of bulk goods as far as a central region of its free upper surface, such that the bulk goods on the surface of the column of bulk goods are only conveyed into the central region from a periphery of the surface.